A revision of south-western Australian species of *Micromyrtus* (Myrtaceae) with five antisepalous ribs on the hypanthium

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Abstract

Rye, B.L. A revision of south-western Australian species of *Micromyrtus* (Myrtaceae) with five antisepalous ribs on the hypanthium. *Nuytsia* 15(1): 101–122 (2002). Among the species currently included in *Micromyrtus* Benth., two main categories are distinguished here on the basis of hypanthium ribbing, one characterised by having antipetalous ribs and usually also antisepalous ones, the other by having antisepalous ribs but no antipetalous ones. Most species belong to the latter category, including the lectotype selected here for the genus, *Micromyrtus drummondii* Benth. *nom. superfl.* [= *M. obovata* (Turcz.) J.W. Green]. A key is given to the 14 Western Australian members of this group, and the eight south-western species, including five new species, are revised. *Micromyrtus erichsenii* Hemsl. is reinstated and the new species *M. monotaxis* Rye, *M. ninghanensis* Rye, *M. papillosa* J.W. Green ex Rye, *M. rogeri* J.W. Green ex Rye and *M. uniovula* Rye are illustrated. Three of these new species have an ovule number of one, lower than any previously recorded for the genus, and four of them have conservation priority.

Introduction

Micromyrtus is an endemic Australian genus belonging to the *Chamelaucium* alliance (cf. Briggs & Johnson 1979) of the Myrtacaeae. No formal sections or other infrageneric groups have been named in *Micromyrtus*, although the genus was reduced to a section of *Thryptomene* Endl. by Mueller (1873), who then and subsequently described new taxa under *Thryptomene*. However, this was not followed in later taxonomic publications such as Bailey (1900) and Gardner (1931). The boundary between *Micromyrtus* and *Thryptomene* was confused when four atypical species were placed in one or both genera by Fitzgerald (1905), Pritzel (in Diels & Pritzel 1904) and Moore (1920). In the absence of a ready means to separate them, the two genera were keyed jointly in Blackall & Grieve (1980). This problem was remedied when Green (1983a) transferred the four atypical species into his new genus *Malleostemon* J.W. Green.

Since 1980, all of the 25 species of *Micromyrtus* known from central and eastern Australia have been treated in revisions or other taxonomic works (Bean 1996; Green 1980, 1983b; Hunter *et al.* 1996; Wilson 1991). Green's studies of the genus in south-western Australia were never completed, but he did erect a monotypic genus, *Corynanthera* J.W. Green (Green 1979), for one new south-western species that shares many diagnostic characters with *Micromyrtus*.

Green (1979: 373) stated "The ovary of *Corynanthera* closely resembles that of a group of species of *Micromyrtus* having 10 stamens and two ovules, suggesting a very close relationship." Strong evidence favouring this opinion is provided by unpublished molecular data, in which the 10-staminate and 2-ovulate *Micromyrtus elobata* (F. Muell.) Benth. formed a sister group with *Corynanthera* rather than associating with the five other *Micromyrtus* species that were sampled (Peter G. Wilson pers. comm.). The latter five species, *M. ciliata* (Sm.) Druce, *M. delicata* A.R. Bean, *M. gracilis* A.R. Bean, *M. hexamera* (Maid. & Betch) Maid. & Betch. and *M. erichsenii*, formed a clade.

Two main categories based on hypanthium ribbing can be distinguished among the *Micromyrtus* species, and these coincide with the two groups delimited by the molecular data. Most *Micromyrtus* species, including the five species forming a clade, have less than ten ribs, usually with one rib opposite each sepal, on the hypanthium. This large species group extends across the Australian mainland and has variable numbers of stamens (5–12) and ovules (1–10) per flower. In the other category, the one with closer affinities to *Corynanthera*, the hypanthium is usually 10-ribbed with one rib opposite each sepal and petal. This group, comprised of *M. elobata* and its relatives, is restricted to the south-west of Western Australia and consistently has ten stamens and two ovules.

Most of the species included in the genus *Micromyrtus* when it was originally described by Bentham (1865, 1867) belong to the more widespread and more speciose category lacking antipetalous ribs on the hypanthium. The purpose of the current paper is to nominate one of the members of this plant group as the lectotype of *Micromyrtus* and to complete the Australia-wide coverage of the group by revising the south-western species, all of which have a 5-ribbed hypanthium. A description applicable to this group throughout its range, and a key to the Western Australian species, are also given.

Methods

All measurements were from dry herbarium collections, with leaf and bracteole measurements taken from the largest of these structures on each specimen. Petal length and most other floral measurements were taken from well pressed mature flowers. Peduncle and style measurements were taken from mature flowers and from fruits. Fruit measurements include the adnate portions of the hypanthium and disc but do not include the length of the free portion of the hypanthium and the persistent sepals.

Distributions were plotted on maps showing the interim biogeographic regions of Thackway & Cresswell (1995) and the following abbreviations are used here for these regions. Botanical provinces are as defined by Beard (1980).

AW – Avon Wheatbelt
ESP – Esperance Plains
JF – Jarrah Forest
MUR – Murchison
COO – Coolgardie
GS – Geraldton Sandplain
MAL – Mallee
YAL – Yalgoo

Formal taxonomy

Micromyrtus Benth. *in* G. Bentham & J.D. Hooker, Gen. Pl. 1, 700 (1865). – *Thryptomene* sect. *Micromyrtus* (Benth.) F. Muell., Fragm. Phyt. Austral. 8, 13 (1873). *Type: Micromyrtus drummondii* Benth. *nom. superfl.* [= *Micromyrtus obovata* (Turcz.) J.W. Green], lectotype here nominated.

Description of the few-ribbed category. *Shrubs* almost prostrate to tall, glabrous. *Leaves* small, with a short or very short petiole, concolorous, gland-dotted, entire or with denticulate to laciniate margins. *Inflorescence* of a subterminal cluster-like or spike-like raceme on each branchlet, sometimes with additional racemes lower down on the same branchlet, with solitary axillary peduncles resembling pedicels, each flower sessile within 2 subtending bracteoles or rarely with an anthopodium; peduncles 1-flowered, ranging from very reduced to greatly exceeding the subtending leaf, terminated by very short hair-like processes. *Bracteoles* imbricate and partially to fully enclosing flower in bud, usually caducous or deciduous, smaller and more scarious than the leaves, the thickened midvein usually prominent on abaxial surface, with a subterminal abaxial protrusion or a terminal point. *Buds* with apex hemispheric. *Flowers* pentamerous in Western Australian species and most eastern Australian ones. *Hypanthium* either turbinate to narrowly obconic and terete to 5-angled, or slightly to very dorsiventrally compressed, adnate to ovary for more than half or almost all its length but with a slightly to widely flared free portion above, with prominent longitudinal ribs or with 5 angles opposite the sepals, sometimes also papillose to prominently rugose or bearded; ribs few at base but sometimes branching towards base or closer to the summit, 5–8(9), in most species one opposite each sepal, in two species the ribs up to 9 and irregularly positioned. *Sepals* 5 or 6, varying from extremely reduced to large and petal-like but distinctly smaller than the petals in most species, somewhat scarious and coloured to almost hyaline, entire or with denticulate to fimbriate margins. *Petals* the same number as the sepals, white in most taxa, pink or yellow in others. *Stamens* 5–10 or 12, with antipetalous ones inserted at summit of hypanthium and antisepalous ones (when present) inserted either at about the same level as antipetalous ones or inserted distinctly lower in the free part of the hypanthium; filament terete to lorate, narrowed at the top. *Anthers* dorsifixed, versatile, 2-celled, more or less oblong or oblong-elliptic, the cells dehiscent by a long slit with both ends reaching the edge of the cell, the slit longitudinal or oblique in relation to the connective; gland much smaller than each cell to almost as large, terminal, united to connective at basal end, which often has 2 lateral lobes, the apex free and directed towards inside of flower and sometimes protruding inwards distinctly beyond the anther cells, releasing contents via an apical pore as pollen is released from anther cells. *Ovary* 1-celled, with a small ovule-bearing cavity above the middle and often more or less terminal, the remainder of the cell filled with spongy tissue; placenta generally subterminal and lateral within the cavity, small; ovules 1–10, collateral, when 4 or more then radially arranged, attached above the middle and tending to be pendulous. *Style* central, terminal (not in a depression), with a simple capitate stigma. *Disc* almost flat to deeply concave or cupped, lining free hypanthium and across summit of ovary, commonly pink to red. *Fruit* indehiscent, with the hypanthium not or scarcely lengthening but becoming more swollen than in flower, 1-seeded or rarely 2-seeded, summit more or less flat; wall crustaceous or leathery, not very thick. *Seed(s)* filling available space in fruit and shaped accordingly, reaching top and usually also the base of fruit, often narrowed towards the base, usually narrowly conic to almost globular, soft, surrounded by a shiny membranous envelope that is very loose and easily dislodged.

Size and distribution. *Micromyrtus* is endemic to mainland Australia. Currently 34 species are recognised from the category revised here with the few-ribbed hypanthium, including 14 Western Australian species. This species group has two main areas of occurrence, one extending from central Australia to the south-west and the other on the eastern side of the mainland (Figure 1A). The greatest concentration of species is in south-eastern Queensland and a smaller concentration of species is found in the south-west of Western Australia.

A further four named species and six unnamed species are currently recognised at PERTH for the other main category of species, characterised by a 10-ribbed hypanthium, that is endemic to the south-west of Western Australia. This brings the total number of Western Australian species of *Micromyrtus* to 24.

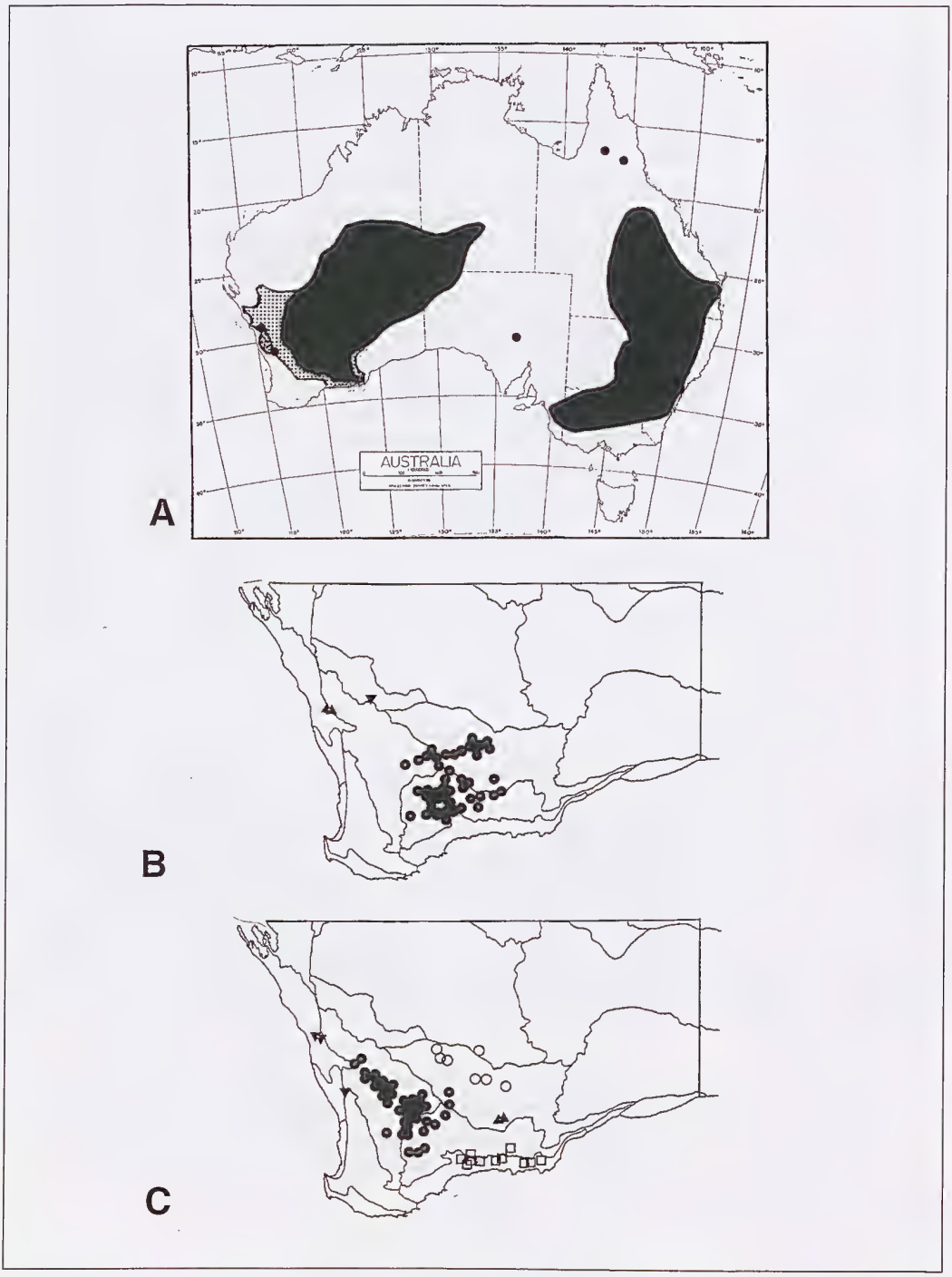

Figure 1. A – Distribution of the few-ribbed *Micromyrtus* species (black), with additional areas of distribution where only 10-ribbed taxa are known (spotted) and the distribution of *Corynanthera* (shaded) also shown; B – Distribution of *Micromyrtus erichsenii* ●, *M. ninghanensis* ▼ and *M. uniovula* ▲; C – Distribution of *M. imbricata* □, *M. obovata* ●, *M. monotaxis* ○, *M. papillosa* ▲ and *M. rogeri* ▼.

Chromosome numbers. Like most other genera in the Myrtaceae, *Micromyrtus* has a base chromosome number of x = 11. Chromosome numbers are known for several Western Australian species (Rye 1979) and one eastern species (Smith-White 1950). *Micromyrtus hursthousei* is tetraploid with n = 22 and the other species are diploid with n = 11. In view of the trend for low chromosome numbers in the Myrtaceae to be found in taxa with low ovule numbers (Rye & James 1992), it would be of interest to determine the chromosome numbers of the uniovulate taxa in *Micromyrtus*. The haploid chromosome numbers recorded in uniovulate members of other genera in the *Chamelaucium* alliance range from 6 to 9.

Lectotypification. Despite the relatively recent revisions of central and eastern Australian species of *Micromyrtus* (see introduction), no lectotype has been nominated for the genus. In the protologue, Bentham (1865) gave the ovule number for the genus as 2 or 4. He indicated that there were six species of *Micromyrtus* but did not list them, referring instead to his coming publication of the genus in Volume 3 of "Flora Australiensis". In that work, Bentham (1867) described the six species referred to earlier, *M. elobata*, *M. racemosa* Benth., *M. imbricata*, *M. obovata* [as *M. drummondii nom. superf.*], *M. ciliata* [as *M. microphylla* (Sieb. ex Spreng.) Benth. *nom. illeg.*] and *M. minutiflora* Benth., and amended his description of the genus to include a seventh species, *M. leptocalyx* Benth., with a higher ovule number of 6–8. Of the original six species, the last four listed have five antisepalous ribs on the hypanthium, and since a majority of the currently named species also have this type of ribbing it seems appropriate to choose the lectotype from among the members of this group. *Micromyrtus drummondii* is here selected as the lectotype for the genus.

Affinities. Table 1 compares the distribution and morphology of the two main categories of *Micromyrtus* species and the closely related monotypic genus *Corynanthera*. On this table the *Micromyrtus* category without antipetalous ribbing and including the type species is referred to as the 'typical group' and the other as the 'atypical group', with the only consistent difference shown being in the hypanthium ribbing. In all members of the typical group, the hypanthium has a rib or angle opposite each sepal. In most cases the hypanthium is best described as 5-ribbed (or 6-ribbed if the flowers are hexamerous) although the ribs may divide irregularly above the middle into 1 or more branches. In two eastern Australian species however, some of the ribs divide very close to the base of the flower, resulting in an irregularly 6–8(9)-ribbed hypanthium. The atypical species group is characterised by having 10 ribs, with one rib opposite each sepal and petal. However, this has become modified in one unnamed species with a very compressed hypanthium, which usually has only the 5 antipetalous ribs visible and sometimes appears to have no ribs.

Corynanthera differs in its hypanthium ribbing from both categories of *Micromyrtus*, having a variable number of obvious ribs opposite the sepals and petals, commonly with an obvious rib opposite the abaxial petal and also prominent ribs opposite three of the sepals. The more obvious stamen characters distinguishing *Corynanthera* from *Micromyrtus* are also listed on the table.

The usually 10-ribbed atypical group of *Micromyrtus* is constant in stamen and ovule number but shows variability in the persistence of the bracteoles, from caducous to remaining attached to the plant until after the fruits are shed, and in the bud apex, which varies from hemispheric to conic. In the usually few-ribbed typical group, stamen and ovule numbers are variable, but the bud apex is always hemispheric and the bracteoles are shed before the fruits mature.

Notes. The flowers are hexamerous in *Micromyrtus hexamera* and either hexamerous or pentamerous in *M. patula* A.R. Bean and *M. rotundifolia* A.R. Bean. All other species have consistently pentamerous flowers. Most eastern species and some western species have only 5 (rarely 6) stamens, one opposite each petal. The remaining species have one stamen opposite each sepal and petal giving a total of 10

Table 1. Comparison of the distribution and morphology of *Corynanthera* and the two main groups of species currently placed *Micromytus* with a primarily few-ribbed or 10-ribbed hypanthium respectively.

Insertion is described as equal where antipetalous and antisepalous stamens (when present) arise at the same level and unequal when the antisepalous ones are inserted distinctly lower than antipetalous ones.

	Corynanthera	*Micromyrtus* typical group	*Micromyrtus* atypical group
distribution	south-west of Western Australia	widespread on Australian mainland	south-west of Western Australia
bracteoles	persistent	caducous or deciduous	caducuous to persistent
bud apex	hemispheric	hemispheric	hemispheric to conic
number of ribs			
antisepalous	usually several	5 or 6	5 or absent
antipetalous	usually 1	absent	5
unaligned	absent	absent or several	absent
total	variable	5–8(9)	usually 10
androecium			
stamen no.	10	5–10 or 12	10
insertion	equal	equal or unequal	unequal
dehiscence	central pore	slits	slits
gland	long-stalked	sessile	sessile
ovule no.	2	1–10	2

stamens, except for the hexamerous *M. hexamera*, which has 12 stamens. *Micromyrtus erichsenii* is remarkable in showing variation in stamen number from 5 to 10, with the number of stamens in the antisepalous whorl varying from 0 to 5 between or within populations and often also varying between different flowers on the same plant.

Most eastern and central Australian species of *Micromyrtus* have 4–10 ovules per flower and the remaining two species have two ovules. In contrast most south-western species have two ovules, and three new species described here have only one ovule, a new record for the genus. Normally only one seed is produced, regardless of the number of ovules present. Being dry, indehiscent and 1-seeded, the fruit is a nut. While many other genera of the *Chamelaucium* alliance also have a nut, reduction of ovule number down to one in these genera is rare, having been recorded only in a few species belonging to *Actinodium* Schauer and *Verticordia* DC.

In *Micromyrtus*, the nut is enclosed in the adnate portions of the hypanthium and disc, and is capped by the free portion of the hypanthium and the persistent sepals. Usually the petals close to an erect position after anthesis and are shed before the fruit matures. *Micromyrtus imbricata* is unusual in having persistent widely spreading petals, which presumably assist in the dispersal of the fruits.

Key to the Western Australian species of *Micromyrtus* with five antisepalous ribs or angles on the hypanthium

1. Hypanthium very compressed, with 2 abaxial, 1 adaxial and 2 lateral ribs. Ovules 1 or (in *M. rogeri*) 2.
   2. Stamens 5. Petals narrowly clawed. (Norseman area.) ..... **M. papillosa**
   2. Stamens 10. Petals fairly broadly clawed or broad-based.
      3. Leaf margins densely and finely laciniate. Sepals denticulate to laciniate. Ovary cavity central; ovules 2. (Arrino area.) ..... **M. rogeri**
      3. Leaf margins entire. Sepals entire. Ovary cavity terminal; ovule 1.
         4. Leaves oblong-elliptic. Adnate portion of hypanthium narrowed towards base, rounded on abaxial surface, with adaxial rib very prominent. (Three Springs area.) ..... **M. uniovula**
         4. Leaves obovate. Adnate portion of hypanthium the same width throughout, almost flat on abaxial surface, with adaxial rib not prominent. (Ninghan Station area.) ..... **M. ninghanensis**
1. Hypanthium terete or (in *M. stenocalyx*) somewhat compressed, with 5 uniformly spaced ribs or 5-angled. Ovules 2 or 6–10.
   5. Hypanthium densely bearded and/or prominently rugose. Stamens 5.
      6. Hypanthium rugose distally and densely bearded below. Style *c.* 2.5 mm long. 7–10. Ovules 2. (Gibson Desert.) ..... **M. barbata**
      6. Hypanthium prominently rugose throughout. Style *c.* 0.5 mm long. Ovules (Wialki to central Australia.) ..... **M. flaviflora**
   5. Hypanthium fairly smooth apart from the 5 ribs. Stamens 5–10 in *M. erichsenii*, 10 in all other species.
      7. Ovules 6–8. Central Australian.
         8. Filaments filiform, less than 0.1 mm wide. Sepals with margin not recurved. (East of Warburton.) ..... **M. helmsii**
         8. Filaments lorate, over 0.3 mm wide. Sepals with margin strongly recurved.
            9. Leaves elliptic to broadly ovate, 1–2 mm long. Sepals with large fimbriate auricles obscuring the hypanthium. (Gibson Desert to far west of South Australia.) ..... **M. fimbrisepala**
            9. Leaves linear to narrowly obovate, 3–4 mm long. Sepals with small denticulate auricles. (Cundeelee to Rawlinson Range.) ..... **M. hymenonema**
      7. Ovules 2. South-western Australian, extending inland to Cundeelee area.
         10. Hypanthium 2.5–3.5 mm long, compressed, scarcely ribbed. Sepals rim-like, 0.1–0.2 mm long. (Rason Lake to Cundeelee area.) ..... **M. stenocalyx**
         10. Hypanthium 0.8–2.5 mm long, not compressed, with 5 prominent ribs. Sepals ovate to depressed ovate, (0.2)0.3–1 mm long.
            11. Hypanthium ribs broad and rounded. Petals widely spreading and becoming reddish in fruit. (Ravensthorpe to Cape Arid National Park.) ..... **M. imbricata**
            11. Hypanthium ribs narrow, sharply angled. Petals closing to a fairly erect position after anthesis.
               12. Flowers with hypanthium 1.5–2.5 mm long and petals 1.9–2.4 mm long. Antisepalous stamens inserted at summit of disc. (Mt Manning Range to Comet Vale to Coolgardie.) ..... **M. monotaxis**
               12. Flowers with hypanthium 0.8–1.6 mm long and petals 1.1–2 mm long. Antisepalous stamens absent or inserted lower on the disc than the antipetalous stamens.

13. Peduncles 0.5–1.5 mm long. Stamens 10. Style 0.35–0.8 mm long. (Wubin to Lake Grace.) ..... **M. obovata**
13. Peduncles 1.3–2 mm long. Stamens 5–10. Style 0.1–0.25 mm long. (Merredin to Coolgardie to Newdegate to Kumarl.) ..... **M. erichsenii**

Previously revised species

Six Western Australian species, *Micromyrtus barbata* J.W. Green, *M. fimbrisepala* J.W. Green., *M. flaviflora* (F. Muell.) F. Muell. ex J.M.Black, *M. helmsii* J.W. Green, *M. hymenonema* (F. Muell.) C.A. Gardner and *M. stenocalyx* (F. Muell.) J.W. Green, occur primarily in the Eremaean Botanical Province and have already been described and illustrated in Green (1980). Four of these taxa differ from the south-western species in having six or more ovules radially arranged around the placenta. The other two species, *M. barbata* and *M. stenocalyx*, have a 5-angled or only slightly 5-ribbed hypanthium that is not or only moderately compressed, whereas the south-western species have the hypanthium either prominently 5-ribbed or very compressed.

Micromyrtus erichsenii Hemsl., *Hooker's Icon. Pl.* Ser. 4, 8, t. 2780 (1905). *Type:* Dedari, 24 miles [39 km] west of Coolgardie, Western Australia, *G.H. Thistleton-Dyer* 43 (*holo:* B *n.v.*, possibly destroyed; *iso:* PERTH (ex B) 01630784).

Illustration. Hemsley (1905: plate 2780).

Shrubs erect, 0.3–2 m high, 0.3–1.2 m diam. *Leaves* widely antrorse to almost appressed, fairly densely arranged on the smaller branchlets. *Petioles* 0.3–0.5 mm long. *Leaf blades* obovate to very broadly obovate in outline, 1.2–2.4 x 0.8–1.2 mm, very thick (almost triangular in cross-section), broadly obtuse, entire; lower surface strongly keeled, with 3–7 prominent glands up to 0.2 mm diam.; upper surface shallowly concave to convex. *Racemes* mostly extending for 3–9(15) nodes, the flowers widely antrorse or patent; peduncles 1.3–2 mm long. *Bracteoles* caducous or deciduous, rather scarious, 0.6–1 mm long, golden-brown or reddish-brown, strongly folded with a glandular keel, incurved at apex, entire. *Flowers* 3–4 mm diam.; hypanthium not compressed, 0.8–1.6 mm long, 0.3–0.5 mm wide at midpoint, 0.6–1 mm wide at summit, free in distal *c.* 0.2 mm, with 5 prominent narrow acute ribs, the ribs occasionally dividing into 2 branches near summit, concave between the ribs. *Sepals* fairly erect in flower and fruit, very broadly or depressed ovate, 0.2–0.6 mm long, 0.3–0.6 mm wide, white or whitish, broadly obtuse, entire or rarely somewhat denticulate. *Petals* with claw fairly erect and remainder widely spreading in flower, erect in fruit, very broadly obovate, 1.1–1.6 mm long, white or cream, sometimes red-tinged on outer surface, broadly obtuse, entire. *Stamens* 5–10, the antipetalous ones inserted inside the summit of disc and with a filament 0.2–0.35 mm long, the antisepalous ones usually absent or reduced in number, inserted distinctly within the margin of the disc and somewhat shorter than antipetalous ones. *Anthers c.* 0.2 mm long; slits oblique or rarely subparallel; gland broad at base with 2 large basal lateral lobes and a more elongate apical portion. *Ovary* with 2 ovules in a more or less terminal cavity. *Style* 0.1–0.25 mm long. *Fruit* 1.3–1.7 mm long, 0.7–1 mm wide, 1-seeded; hypanthium 5-ribbed. *Seed* truncate-obovoid, 1.1–1.4 mm long, 0.6–0.8 mm wide; enveloping membrane 5-angled, golden brown.

Selected specimens examined. WESTERN AUSTRALIA: 36 miles [58 km] S of Norseman, 15 May 1968, *E.M. Bennett* 2154 (MEL *n.v.*, PERTH); 2 miles [3 km] E of Ghooli, 7 Oct. 1953, *H.F. & M. Broadbent* (BM); 65.2 km NE of Mukinwobert Rock, 7 Sep. 1983, *M.A. Burgman* 2217 *& S. McNee* (PERTH); Coolgardie goldfield, Oct. 1901, *E. Pritzel* 863 (PERTH ex B); *c.* 1 km SW of Digger Rocks,

6 Sep. 1996, *N. Gibson & K. Brown* 3735 (PERTH); N of Mt Day, Bremer Range, 22 Sep. 1994, *N. Gibson & M. Lyons* 1962 (PERTH); 10.5 miles [17 km] from Newdegate to Lake Grace, 14 Sep. 1971, *S. Paust* 829 (CBG *n.v.*, PERTH); South Iron Cap, 7 Oct. 1976, *B.L. Rye* 76010 (PERTH); Great Northern Highway, 17 km E of Southern Cross, 30 Sep. 1981, *R. Spjut, G. White, R. Phillips & L. Lacy* 7255 (PERTH); 20.4 km W of Bullabulling, 1 Sep. 1982, *C.I. Stacey* 715 (PERTH).

Distribution and habitat. Occurs in the South-western Interzone and eastern parts of the South West Botanical Province: AW, COO, ESP, MAL. Recorded in a roughly square area bounded by Merredin, Coolgardie, Newdegate and Kumarl (south of Norseman). Inhabits sandplains and more clayey flats, the soil colour often yellow or brown, in shrublands or very open woodlands dominated often by mallees (*Eucalyptus*), *Allocasuarina* or *Acacia* species. (Figure 1B)

Phenology. Flowers recorded February to November, especially July to October. Fruiting closely follows flowering and mature fruits are often present on plants that also have open flowers and buds.

Chromosome number. n = 11 [as *Micromyrtus drummondii*], voucher *B.L. Rye* 76010 (Rye 1979).

Affinities. Previously confused with, and reduced to a synonym of, *Micromyrtus obovata*, but differing in its smaller leaves and flowers, longer peduncles, usually shorter sepals, extremely short style, shorter stamens and usually lower stamen number, often more oblique anther cells, and much greater tendency to produce fertile fruits. The two species are largely geographically separated, *M. obovata* occurring in the west and *M. erichsenii* in the east, but their ranges overlap in the Merredin to Hyden area.

Another close relative of *Micromyrtus erichsenii*, which was also previously included under *M. obovata*, is the new species *M. monotaxis* (see notes under that species). All three species have the disc relatively horizontal and prominently patterned with large low tubercles.

Notes. Micromyrus erichsenii is a common and extremely variable species. Specimens from the far north of the species range vary in stamen number from 5 to 10, the type specimen being one of those with 10 stamens. Elsewhere in the species range, most specimens have regularly 5 stamens or vary from 5 to 7 stamens. In the 10-staminate flowers, the antipetalous filaments tend to be longer (0.25–0.35 mm) than those of 5-staminate flowers, which are 0.2–0.3 mm long.

In the south-eastern part of the range, especially in the vicinity of Frank Hann National Park, there are some relatively large-leaved and large-flowered specimens (e.g. *Paul G. Wilson* 5703), with petioles up to 0.5 mm long, flowers up to 4 mm in diameter and sepals up to 0.6 mm long, but these still have 5 short stamens and the extremely short style that is characteristic of the species. This variant intergrades with the more typical variant that is common in adjacent areas. Excluding the large-flowered south-eastern variant, the species has flowers 3–3.5 in diameter and sepals 0.2–0.4 mm long.

Considerable variation in growth pattern is also seen in the species, some of which must be related to the age and fire history of the plants, but a genetic component may be significant. Some of the northern specimens (e.g. *Spjut et al.* 7255) have stems much-branched and forming a shrub shape *c.* 0.2 m high, from which a few tall erect branches arise, extending up to a maximum of 2 m above the ground. This type of growth pattern has also been reported in *M. monotaxis* (M. Hislop pers. comm.) and in some less closely related species.

Field studies are needed to further elucidate the variation in *Micromyrtus erichsenii*.

Micromyrtus imbricata Benth., Fl. Austral. 3, 64 (1867). *Type:* sandy places, Termination Granite, [*c.* 53 km north-east of Israelite Bay, Western Australia], *G. Maxwell* (*holo:* K *n.v.*).

Illustration. Blackall & Grieve (1980: 43).

Shrub 0.2–1 m high, erect and slender to intricately branched and widely spreading. *Leaves* widely to fairly closely antrorse, densely arranged distally on the branchlets. *Petioles* 0.4–0.6 mm long. *Leaf blades* broadly to depressed obovate, 1.5–3 x 1.3–2 mm, broadly obtuse, entire, with a prominent keel at least in distal half and incurved at apex; lower surface shallowly folded-convex, with usually 4–6 prominent glands up to *c.* 0.2 mm diam. in each longitudinal row; upper surface slightly concave. *Racemes* mostly extending for 3–20 nodes, the flowers widely spreading and sometimes becoming pendulous in fruit; peduncles 1.2–3 mm long. *Bracteoles* caducous, with a herbaceous keel and narrow scarious incurved margins and very incurved apex, narrowly obovate to almost ovate, 0.6–2 mm long, often brown or reddish, entire, with prominent glands. *Flowers* 4–5 mm diam.; hypanthium narrowed at base to a usually distinct anthopodium, top-shaped (broadly conic) above but commonly with a somewhat rounded base, not compressed, 1.4–2 mm long (including an anthopodium up to 1 mm long), 0.6–0.8 mm wide at midpoint, 1.4–1.5 mm wide at summit, free in distal 0.3–0.4 mm, very prominently 5-ribbed, sometimes with additional intermediate ribs partially developed (at base or on free portion of hypanthium) or very rarely with some of the five ribs branching towards the top, smooth between the ribs, often glossy, the ribs usually very obtuse. *Sepals* erect to spreading in flower, erect in fruit, broadly to depressed ovate, 0.5–0.8 mm long, 0.6–1 mm wide, often pink- or red-tinged, broadly obtuse, entire or sometimes minutely toothed. *Petals* with claw erect and lamina widely spreading in flower and fruit, very broadly obovate or almost circular, 1.5–2.3 mm long, distinctly clawed at base, often pinkish or red-tinged outside, white or sometimes pale pink inside at first, becoming more pink and then reddish in fruit, broadly obtuse, entire. *Stamens* 10, the antipetalous ones inserted on inside of summit of disc, the antisepalous ones distinctly lower near middle of free tube; filament 0.3–0.5 mm long. *Anthers c.* 0.3 mm long; slits very oblique (about half way between longitudinal and transverse); gland compact and broader than long, with multiple densely packed lobes surrounding the very short apical portion. *Ovary* with 2 ovules in a terminal cavity. *Style* 0.5–1 mm long. *Fruit* broadly conic with a pinched-in base, 1.1–1.4 mm long, 1–1.3 mm wide, 1-seeded; hypanthium prominently 5-ribbed, glossy. *Seed* of approximately the same shape as the fruit including less prominent ribs, 0.9–1 mm long, 0.7–0.8 mm wide; enveloping membrane golden brown with reddish flecks.

Selected specimens examined (all PERTH). WESTERN AUSTRALIA: corner of Melaleuca Rd and West Point Rd, 9 Sep. 1992, *G.F. Craig* 2026; 26.5 km SE of Scaddan, 4 Oct. 1995, *R.J. Cranfield* 10456; Mt Burdett, Wittenoom Hills Nature Reserve, 8 Nov. 1992, *A.M. Lyne* 1090, *L. Craven & F. Zich* (ex CBG); 35 km E of Ravensthorpe, 16 Nov. 1981, *K.R. Newbey* 9411; 7 km N of Mt Baring, Cape Arid National Park, 12 Oct. 1984, *K.R. Newbey* 9753; N of Howick Hill, 3 Oct. 1982, *B.L. Rye* 82026; 9 miles [14.5 km] N of Thomas River, Oct. 1933, *H. Steedman*; 5 km N of Dunn Swamp, *c.* 80 km NE of Ravensthorpe, 21 Sep. 1979, *J. Taylor* 741, *M.D. Crisp & R. Jackson* (ex CBG).

Distribution and habitat. Extends from the Ravensthorpe area east to Cape Arid National Park in the south-eastern portion of the South West Botanical Province: ESP, MAL. Commonly recorded on flat, relatively low-lying ground, in a variety of sandy soils, sometimes over granite, in shrublands often dominated by mallees (*Eucalyptus*). (Figure 1C)

Phenology. Flowers and fruits: mainly August to November.

Notes. Micromyrtus imbricata is a very variable species but without any obvious geographic trends among its numerous populations. Its affinities are unclear. It is the only Western Australian species to have very broad, usually rounded ribs on the hypanthium that are rather similar to the ribs found in a group of eastern Australian species including *M. ciliata*. However the *M. ciliata* group differs in a number of characters including its very short peduncles, 5 stamens and 4 ovules. *M. imbricata* also has a very compact multi-lobed gland, unlike that of the *M. ciliata* group.

Micromyrtus monotaxis Rye, *sp. nov.*

Micromyrto obovato affinis sed floribus et pedunculis grandioribus, staminis uniseriatis supra apice vel extrinsecus apice disci, stylo filamentis distincte breviora differt.

Typus: on north side of track between Kurrajong and Pittosporum rockholes, *c.* 17.2 km north-north-west of Mt Dimer, Hunt Range, Jaurdi Station, Western Australia,18 July 1995, *N. Gibson & M. Lyons* 3706 (*holo:* PERTH 05323509; *iso:* CANB, MEL).

Shrubs erect, moderately dense, (0.3)0.7–1.6 m high, up to 1.6 m diam. *Leaves* widely to closely antrorse, densely arranged on the smaller branchlets. *Petioles* 0.3–0.4 mm long. *Leaf blades* obovate to very broadly obovate in outline, 1.7–3.5 x 1.3–1.5 mm, very thick (almost triangular in cross-section), broadly obtuse, entire or denticulate; lower surface strongly keeled, with 3–6 prominent glands up to 0.2 mm diam.; upper surface shallowly concave to convex. *Racemes* mostly extending for 2–8 nodes, the flowers widely antrorse or patent; peduncles 1–2.5 mm long. *Bracteoles* caducous and rarely seen, rather scarious, strongly folded with a glandular keel, up to 1.3 mm long, incurved at apex, entire. *Flowers* 4.5–6 mm diam.; hypanthium not compressed, 1.5–2.5 mm long, *c.* 0.6 mm wide at midpoint, *c.* 1.3 mm wide at summit, free in distal *c.* 0.3 mm, with 5 prominent narrow acute ribs, concave between the ribs. *Sepals* fairly erect in flower and fruit, somewhat scarious, almost square to depressed ovate, 0.5–1 mm long, 0.6–1.3 mm wide, white, broadly obtuse, entire or denticulate. *Petals* with claw fairly erect and remainder widely spreading in flower, becoming erect and eventually shed from mature fruit, very broadly obovate, 1.9–2.4 mm long, white, broadly obtuse, entire or denticulate. *Stamens* 10, inserted more or less at the same height on the outside or on the summit of disc, the antipetalous ones usually distinctly outside the disc; filament 0.6–0.9 mm long. *Anthers c.* 0.25 mm long; slits subparallel (slightly oblique but much closer to longitudinal than transverse); gland broad at base with 2 large lateral lobes, with a more elongate apical portion. *Ovary* with 2 ovules in a more or less terminal cavity. *Style* 0.3–0.5 mm long. *Fruit c.* 1.8 mm long, *c.* 1.3 mm wide, 1-seeded; hypanthium 5-ribbed. *Seed* obovoid (with base very narrow), *c.* 1.5 mm long, *c.* 0.9 mm wide; enveloping membrane 5-angled, golden brown. (Figure 2A–D)

Selected specimens examined (all PERTH). WESTERN AUSTRALIA: 4.3 km NE of main road, 1 km N of Comet Vale, 16 June 1988, *R.J. Cranfield* 7036; 10 km E of Bullabulling, 23 Aug. 1995, *R. Davies* 59; between Die Hardy Range and Mt Manning Range, 17 Mar. 1978, *A.S. George* 15123; Coolgardie, Oct. 1900, *E. Kelso*; 9 km NW of Stewart, *c.* 75 km WNW of Coolgardie, 26 Aug. 1981, *K.R. Newbey* 8701; 15 km NE of Bungalbin Hill, 1 Dec. 1981, *K.R. Newbey* 9435; 14 km NE of Bungalbin Hill, 23 Sep. 1981, *K.R. Newbey* 8990; 11 miles [18 km] from Coolgardie towards Southern Cross, 5 Sep. 1968, *M.E. Phillips* (ex CBG).

Distribution and habitat. Occurs in the Eremaean Botanical Province and South-western Interzone, extending from near Die Hardy Range east to Comet Vale and south-east to Coolgardie: COO, MUR.

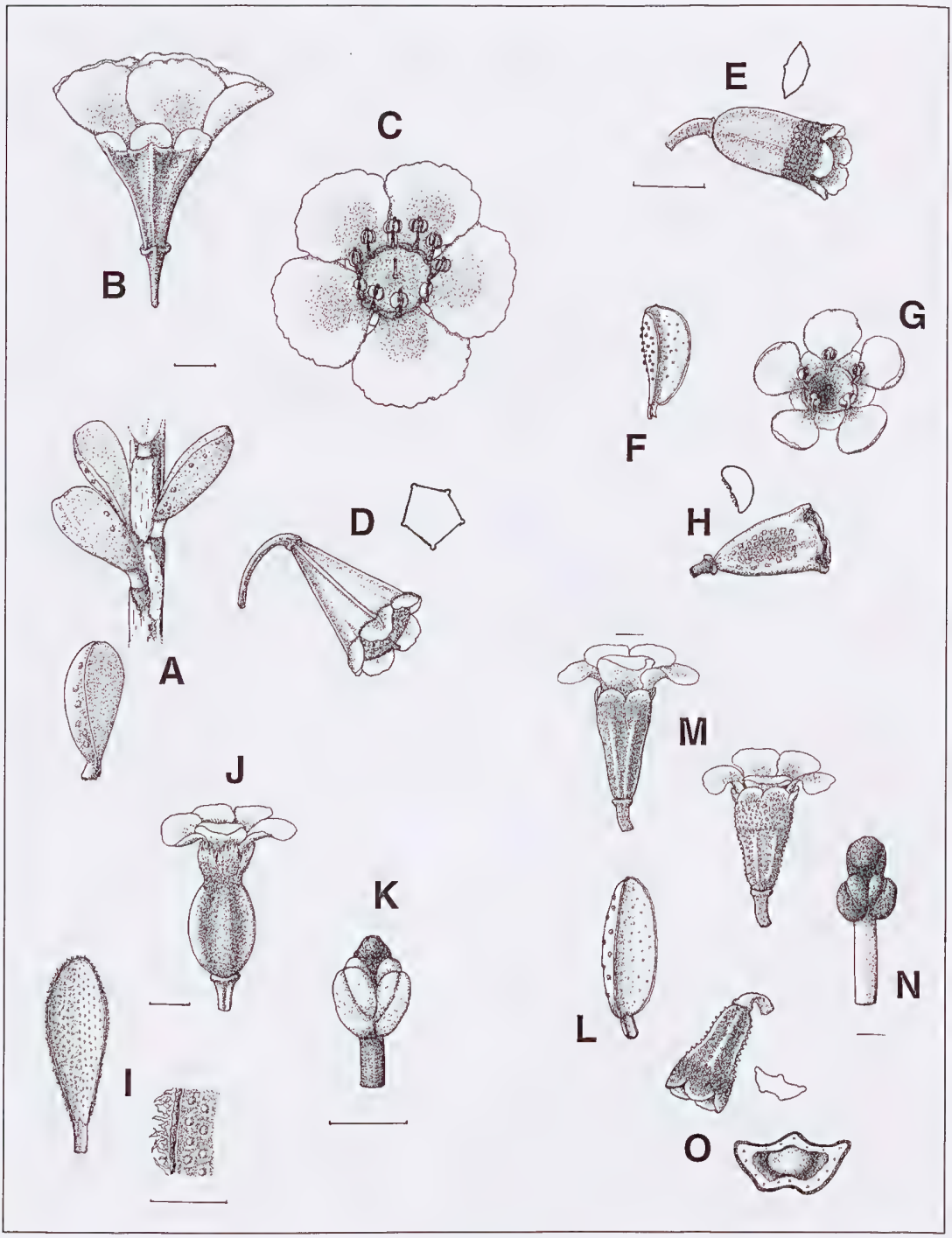

Figure 2. A–D. *Micromyrtus monotaxis*. A – leaves, B – side view of flower, C – top view of flower, D – fruit (with TS); E – *M. ninghanensis*, adaxial view of fruit (with TS); F–H. *M. papillosa*. F – leaf, G – top view of flower, H – adaxial view of fruit (with TS); I–K. *M. rogeri*. I – leaf with margin enlarged; J – adaxial view of flower, K – stamen; L–O. *M. uniovula*. L – leaf, M – abaxial view of two flowers, N – stamen, O – adaxial view of fruit with TS showing immature seed. Scale bars 0.5 mm for stamens (K,N), 1 mm elsewhere. Drawn by Lorraine Cobb from *C.A. Gardner* 13469 (A,D), *R.J. Cranfield* 7036 (B,C), *R.J. Cranfield* 8619 (E), *R.J. Cranfield* 741 (F,G), *D.J.E. Whibley* 4580 (H), *M.A. Langley & J.K. Harvey* 1875 (I–K), *L. Polomka & S.J. Patrick* 3307 (L–N) and *R.J. Cranfield* 7903 *& P.J. Spencer* (M,O).

Recorded mainly from yellow sandplains, also recorded from reddish soil near Comet Vale, in shrublands dominated by a variety of species including *Callitris preissii*. (Figure 1C)

Phenology. Flowers: March to December, especially August to October. Only one specimen (*C.A. Gardner* 13469) was in mature fruit, and this had good seed set as in *M. erichsenii*. It was collected in early September from Comet Vale.

Etymology. From the Greek *monos* – single and *taxis* – row, referring to the arrangement of all the stamens at the summit of the hypanthium, rather than having the antisepalous ones inserted at a distinctly lower position than the antipetalous ones. This character distinguishes the species from its two closest relatives.

Affinities. Closely related to *Micromyrtus erichsenii* and *M. obovata*, both or which tend to have shorter or less bulky leaves and smaller flowers. In these two species the antisepalous stamens are either absent or inserted in a different position from the antipetalous ones. *Micromyrtus erichsenii* also differs from *M. monotaxis* in its shorter style and stamens, and usually has fewer stamens with the anther cells more oblique. *M. obovata* tends to have shorter peduncles, more numerous flowers, and its style longer and more similar in length to the filaments, not distinctly shorter than the filaments as in *M. monotaxis*.

Micromyrtus monotaxis occurs mainly north-east of the range of *M. erichsenii* but the two taxa show a slight overlap in range. No intermediates are known. *M. monotaxis* occurs further inland, and is geographically separated from, *M. obovata*. The three species show considerable overlap in flowering time and no great differences in soil and landform preferences, although *M. obovata* appears to occur more frequently on hills and in gravelly soil than do the other two species.

Notes. All stamens are inserted at the summit of the hypanthium but the antisepalous stamens often appear to be inserted slightly differently from the antipetalous stamens, at the summit of a dip in the disc, which appears shallowly lobed, rather than distinctly outside the disc as in the antipetalous stamens. One of the flowers on *R.J. Cranfield* 7036 was observed to have 11 stamens rather than the normal 10.

Micromyrtus ninghanensis Rye, *sp. nov.*

Micromyrto uniovulo multo affinis sed foliis maturibus tenuioribus et obovatus, hypanthii basi magis rotundata, costa adaxiali minus prominenti differt.

Typus: Ninghan area [precise locality withheld], Western Australia, 24 October 1984, *M.G. Corrick* 9332 (*holo:* PERTH 02422417; *iso:* MEL *n.v.*).

Shrub low and spreading, up to 0.4 m high. *Leaves* antrorse, densely arranged distally on the branchlets. *Petioles* 0.4–0.5 mm long. *Leaf blades* narrowly to broadly obovate, 2.2–3.7 x 1.1–1.4 mm, broadly obtuse, more or less entire; lower surface convex, with 4–6 prominent glands up to *c.* 0.1 mm diam. in each longitudinal row; upper surface concave. *Racemes* mostly extending for 2–15 nodes, the flowers antrorse to patent; peduncles 0.7–0.8 mm long. *Bracteoles* caducous or deciduous, scarious, ovate, *c.* 1 mm long, usually rather dark red-brown, acute, entire. *Flowers* 3–3.5 mm diam.; hypanthium very dorsiventrally compressed in adnate part, the free portion more open, depressed-conic with a rounded base, *c.* 1.8 mm long, *c.* 1.2. mm wide, free in distal 0.5–0.7 mm, not very prominently 5-ribbed, with 2 abaxial, 1 adaxial and 2 lateral ribs, the lateral ribs tending to be better defined than the other ribs, convex and usually fairly smooth but with prominent oil glands on abaxial surface, concave to flat and

usually minutely papillose on adaxial surface, the papillae less than 0.05 mm long. *Sepals* erect in flower and fruit, scarious, very depressed ovate, 0.2–0.35 mm long, 0.5–0.6 mm wide, pale brownish throughout or darker and with a pale margin, very broadly obtuse, entire. *Petals* widely spreading in flower, becoming erect then shed in fruit, broadly or very broadly obovate, 1.3–1.6 mm long, distinctly clawed at base, white, broadly obtuse, entire. *Stamens* 10, all about equal, the antipetalous ones inserted on summit of disc and somewhat exserted, the antisepalous ones inserted near middle of free tube and included; filament 0.3–0.4 mm long. *Anthers* 0.3–0.35 mm long; slits oblique (often almost transverse); gland very broad and extending laterally beyond the cells, 3-lobed, the 2 large lateral lobes of a similar size to apical portion. *Ovary* with a solitary ovule in a more or less terminal cavity. *Style c.* 0.35 mm long. *Fruit* very compressed, rectangular with rounded base, *c.* 1.3 x 0.9–1 mm; hypanthium *c.* 2 mm long, adaxial surface usually papillose. *Seed* very compressed, *c.* 1.1 x 0.7 mm, with summit fairly truncate and base rounded; enveloping membrane medium brown. (Figure 2E)

Other specimens examined. WESTERN AUSTRALIA: type locality, 7 Sep. 1973, *J.S. Beard* 6452 (PERTH); type locality, 21 Nov. 1992, *R.J. Cranfield* 8619 (PERTH).

Distribution and habitat. Apparently restricted to the Ninghan area in the Eremaean Botanical Province: YAL. Occurs on a greenstone-granite hill, in reddish or brown clay, in a low open woodland of *Acacia* and Casuarinaceae. (Figure 1B)

Phenology. Flowers: September to late October. Fruits recorded late October to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. Known from only one locality.

Etymology. The specific epithet refers to the occurrence of the taxon in the Ninghan Station area.

Notes. Previously known informally as *Micromyrtus* sp. Ninghan (*M.G. Corrick* 9332). The differences between this species and its closest relative *M. uniovula* are noted under the latter species. *Micromyrtus ninghanensis* has been confused with *M. papillosa*, another species with only one ovule in the ovary. *M. papillosa* differs in its longer pedicels, more narrowly clawed petals, more papillose hypanthium and five stamens, apparently also tending to be a more erect plant with narrower leaves.

Micromyrtus obovata (Turcz.) J.W. Green, Census Vasc. Pl. W. Austral. 2 edn, 6 (1985). – *Thryptomene obovata* Turcz., *Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg* 10: 322 (1852). *Type:* south-western Australia, [Western Australia], 1847–1849, *J. Drummond* coll. 5 suppl., n. 23 (*holo:* KW *n.v.*, photograph PERTH; *iso:* K *n.v.*, PERTH 01829548, 01828564).

Micromyrtus drummondii Benth. *nom. superfl.*, Fl. Austral. 3: 64–65 (1867). – *Thryptomene drummondii* (Benth.) F. Muell., Syst. Census Austral. Pl. 53 (1882). *Type:* south-western Australia, [Western Australia], 1847–1849, *J. Drummond* coll. 5 suppl., n. 23 (*holo:* K *n.v.*; *iso:* KW *n.v.* (photograph PERTH), PERTH 01829548, 01828564).

Illustration. Blackall & Grieve (1980: 43).

Shrubs erect, 0.4–1.6 m high, up to at least 1 m diam., often with numerous stems from the base

forming a dense growth habit. *Leaves* widely antrorse to appressed, fairly densely arranged on the smaller branchlets. *Petioles* 0.3–0.5 mm long. *Leaf blades* obovate to very broadly obovate in outline, 1.5–3(3.8) x 0.8–1.4 mm, very thick (almost triangular in cross-section), broadly obtuse, entire; lower surface strongly keeled, with 4–6 prominent glands up to 0.2 mm diam.; upper surface concave to convex. *Racemes* mostly extending for 6–20 or more nodes, the flowers widely antrorse or patent; peduncles 0.5–1.5 mm long. *Bracteoles* caducous to fairly persistent, rather scarious, strongly folded with a glandular keel, 0.9–1.4 mm long, incurved at apex, often red-tinged distally, entire. *Flowers* 4–5 mm diam.; hypanthium not compressed, 1.2–1.5 mm long, 0.5–0.7 mm wide at midpoint, 1–1.3 mm wide at summit, free in distal 0.2–0.4 mm, with 5 prominent narrow acute ribs, concave between the ribs. *Sepals* fairly erect in flower and fruit, somewhat scarious, ovate or elliptic to depressed ovate, 0.4–0.7 mm long, 0.5–1 mm wide, white, broadly obtuse, entire or finely denticulate. *Petals* with claw fairly erect and remainder widely spreading in flower, erect in fruit then eventually shed, very broadly obovate, 1.5–2 mm long, white, broadly obtuse, entire to shortly and finely fimbriate. *Stamens* 10, the antipetalous ones inserted on inside or on the summit of disc and with a filament (0.4)0.5–0.8 mm long, the antisepalous ones slightly shorter, inserted lower down on disc. *Anthers c.* 0.25 mm long; slits subparallel (slightly oblique but much closer to longitudinal than transverse); gland broad at base with 2 large lateral lobes, with a more elongate apical portion. *Ovary* with 2 ovules in a terminal cavity. *Style* (0.35)0.5–0.8 mm long. *Fruit* 1.3–1.4 mm long, 0.9–1.2 mm wide, usually failing to set seed, 1-seeded when fertile; hypanthium 5-ribbed. *Seed* truncate-obovoid, *c.* 1.2 x 0.7 mm; enveloping membrane somewhat 5-angled, golden brown.

Selected specimens examined (all PERTH). WESTERN AUSTRALIA: Nature Reserve 28715, 20 km N of Hyden, 6 Sep. 1984, *J.M. Brown* 142 (also CANB *n.v.*); Schillings remnant, 3 km W of Totadgin Rd on Fuschbichler Rd, Bruce Rock area, 14 Aug. 1998, *J. Buegge* D69; *B.J. Conn* 2267 *& B.C. Conn* (ex NSW); Boucher Rd, 1 km W of Manual Rd, Wubin area, 27 Aug. 1998, *R. Davis* 6515; 6.2 km S of Lake Grace, 2 Sep. 1991, *C.I. Stacey* 728 (also CBG *n.v.*); 6.4 km N of Muntadgin, 3 Sep. 1991, *C.I. Stacey* 733; 0.5 km S of Burakin and then 0.4 km NE along a track, 31 Aug. 1975, *M.E. & M.E. Trudgen* 1427 (also CBG, K, MEL *n.v.*); 17 km N of Kondinin, 21 Sep. 1964, *Paul G. Wilson* 3441 (also AD *n.v.*).

Distribution and habitat. Occurs in the South West Botanical Province and South-western Interzone, extending from Wubin south-east to the Lake Grace area and inland to near Parker Range (south of Southern Cross): AW, COO, MAL. Occurs in yellow or brownish sandy soils, often with gravel, sometimes with clay, on hills or hillsides or on flat ground, in low shrublands to woodlands commonly dominated by species of *Allocasuarina*, *Acacia*, *Eucalyptus*, *Melaleuca* or *Hakea*. (Figure 1C)

Phenology. Flowers: July to September. Despite the large number of specimens with older fruits present, these were nearly always undeveloped (i.e. not swollen) and mature seeds were observed only on *G. Perry* 536. The only other specimen (*E.J. Croxford* 2081) with swollen mature fruits had its seeds apparently late-aborted.

Affinities. See notes under its closest relatives *M. erichsenii* and *M. monotaxis*. In comparison with those two species, *M. obovata* tends to have shorter peduncles, more numerous flowers and a more exposed stigma. The longer style of this species in comparison with its relatives may be an indication of a greater adaptation for outbreeding, which may be related to its reduced fecundity. From the very few mature fruits that have been observed, *M. obovata* appears to have a fruit that is more top-shaped than that of *M. erichsenii*, with a broader summit, but more observations are needed to check this character.

Notes. Bentham (1867) described the stamens as five for this species (under his *Micromyrtus drummondii*) although it regularly has 10 stamens. Perhaps Bentham was including 5-staminate material of *M. erichsenii* under this taxon although he did not cite any collections other than the type of *M. obovata*.

A great majority of the specimens have a style 0.5–0.8 mm long. In the central wheatbelt there are also a few specimens with a style 0.35–0.45 mm long, intermixed with specimens with a longer style.

Micromyrtus papillosa J.W. Green ex Rye, *sp. nov.*

Bracteolae deciduae. Alabastri apex hemisphericus. Hypanthium c. 2 mm longum, parte inferiore dorsiventraliter compressum, pagina adaxiali papillata. Sepala erecta, petalis multo breviora, integra. Petala anguste unguiculata, alba, in fructu decidua. Stamina 5, brevia. Ovulum 1.

Typus: Beacon Hill, Norseman, Western Australia, 4 September 1968, *M.E. Phillips* (*holo:* PERTH (ex CBG) 01630822; *iso:* CBG 025387 *n.v.*).

Shrub erect but often low and spreading, 0.4–1.2 m high, 0.4–1.5 m wide. *Leaves* antrorse, densely arranged distally on the branchlets. *Petioles* 0.4–0.6 mm long. *Leaf blades* obovate, broadly obovate, or occasionally obcordate, 1.5–3.5 x 1.4–1.7 mm, broadly obtuse or occasionally emarginate, entire or almost so; lower surface convex, with 8–12 prominent glands up to *c.* 0.1 mm diam. in each longitudinal row; upper surface concave. *Racemes* mostly extending for 5–20 nodes, the flowers usually widely antrorse; peduncles 0.4–0.6 mm long. *Bracteoles* deciduous, scarious, ovate or broadly ovate, 0.6–1 mm long, usually pale brown, acute, entire. *Flowers* 3–4 mm diam.; hypanthium very dorsiventrally compressed in adnate part, the free portion more open, depressed-conic with a rounded base, *c.* 2 mm long, *c.* 1.2 mm wide, free in distal 0.4–0.5 mm, scarcely ribbed or somewhat 5-ribbed, with 2 abaxial, 1 adaxial and 2 lateral ribs, glossy, abaxial surface fairly smooth but with the prominent oil glands sometimes protruding as short papillae, adaxial surface concave and prominently papillose, the papillae *c.* 0.1 mm long. *Sepals* erect in flower, erect to closed inwards in fruit, somewhat scarious, very broadly or depressed ovate, 0.3–0.5 mm long, 0.5–0.7 mm wide, green to deep red-brown with a white margin, broadly obtuse, entire. *Petals* widely spreading in flower, becoming erect then shed in fruit, broadly or very broadly obovate, 1.3–1.6 mm long, distinctly clawed at base, white, broadly obtuse, entire. *Stamens* 5, inserted at summit of disc; filament 0.35–0.5 mm long. *Anthers* 0.2–0.25 mm long; slits very oblique; gland simple. *Ovary* with a solitary ovule in a more or less terminal cavity. *Style c.* 0.5 mm long. *Fruit* compressed, with a rounded base, not seen at maturity; abaxial surface of hypanthium smooth, glossy, prominently gland-dotted; adaxial surface of hypanthium prominently papillose, glossy. (Figure 2F–H)

Selected specimens examined (all PERTH). WESTERN AUSTRALIA: Mt Norcott, '10 km E' [*c.* 20 km ENE] of Norseman, 22 Sep. 1978, *R.J. Cranfield* 741; Jimberlana Hill, NE of Norseman, 20 Apr. 1997, *R. Davis* 3056; summit of Jimberlana Hill, 15 Apr. 1995, *B.J. Lepschi & T.R. Lally* 1809; Jimberlana Hill, 2 Oct. 1979, *K.R. Newbey* 6163 (also CANB *n.v.*); near base of Jimberlana Hill, 20 Aug. 1980, *K.R. Newbey* 7184; 5 miles [8 km] N of Norseman, 8 Aug. 1951, *R.D. Royce* 3473; *c.* 8 km NE of Norseman, 29 Oct. 1974, *D.J.E. Whibley* 4580 (also AD *n.v.*).

Distribution and habitat. Restricted to the Norseman area in the South West Botanical Province: YAL. Occurs on hills, from near the base to the summit, in sandy or clay soil with ironstone or granite rocks or slabs. (Figure 1C)

Phenology. Flowers: August to early October, also recorded April. Fruits: recorded in October.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. Recorded from three hills within a range of less than 30 km and not known from any conservation reserves.

Etymology. The specific epithet refers to the papillose hypanthium.

Notes. Its closest relatives are the other two uniovulate species, *Micromyrtus ninghanensis* and *M. uniovula*, both of which differ in having 10 stamens, less prominent papillae on the hypanthium and less strongly clawed petals. The strongly clawed petals of *M. papillosa* seem unusual in the genus.

Micromyrtus rogeri J.W. Green ex Rye, *sp. nov.*

Bracteolae deciduae. Folia juvenia dense ciliata. Alabastri apex hemisphericus. Hypanthium 2–2.5 mm longum, parte inferiore dorsiventraliter compressum, costis 2 abaxialibus, 1 adaxialibus et 2 lateralibus. Sepala erecta, petalis multo breviora, manifeste denticulata usque laciniata. Petala alba, in fructu decidua. Stamina 10, maxime brevia, filamentum anthera breve. Ovula 2.

Typus: 18–20 miles [29–32 km] west-north-west of Arrino, Western Australia, 22 July 1980, *R. Hnatiuk* 800019 (*holo:* PERTH 01631306; *iso:* CANB, K, NSW all *n.v.*, PERTH 01631314).

Shrubs 0.2–0.4 m high, with multiple erect stems from a lignotuber. *Leaves* antrorse to appressed, fairly densely arranged distally on the stems. *Petioles* 0.5–0.6 mm long. *Leaf blades* obovate, 3–4.5 x 2–2.5 mm, broadly obtuse, with a white, densely and finely laciniate margin at first, the white margin tending to be shed in older leaves but more persistent towards the base; lower surface convex, with 8–10 prominent glands up to 0.1 mm diam. in each longitudinal row; upper surface concave. *Racemes* mostly extending for 3–8 nodes, the flowers antrorse; peduncles 0.8–1.3 mm long. *Bracteoles* deciduous, scarious, narrowly ovate or ovate, *c.* 2 mm long, pale brown, acute to acuminate, prominently denticulate. *Flowers c.* 3.5 mm diam., with faint fragrance; hypanthium very dorsiventrally compressed in adnate part, the free portion more open, compressed-urceolate, 2–2.5 mm long, *c.* 1.5 mm wide at midpoint of swollen base, *c.* 1 mm wide at neck and *c.* 1.3 mm at summit, free in distal 0.7–1 mm, somewhat 5-ribbed, with 2 abaxial, 1 central adaxial and 2 lateral ribs, somewhat concave on adaxial surface, smooth and glossy at first but apparently becoming duller and somewhat papillose in young fruit. *Sepals* fairly erect in flower and fruit, scarious, broadly or very broadly ovate, 0.4–0.5 mm long, 0.4–0.6 mm wide, broadly obtuse, prominently denticulate to laciniate. *Petals* with base erect and remainder widely spreading in flower, becoming erect then shed in fruit, broadly or very broadly obovate, *c.* 1.5 mm long, white, broadly obtuse, more or less entire. *Stamens* 10, with the 5 antipetalous ones at the throat and distinctly higher than the 5 included antisepalous ones; filament 0.2–0.25 mm long, shorter than or as long as the anther. *Anthers c.* 0.45 mm long in antipetalous and *c.* 0.35 mm long in antisepalous stamens; slits oblique (somewhat closer to longitudinal than to transverse); gland larger and with more prominent lateral lobes on antisepalous stamens, the large apical portion globular. *Ovary* with 2 ovules in an almost central cavity. *Style c.* 0.5 mm long. *Fruit* not seen at maturity, compressed-urceolate; hypanthium very compressed and with ribs no longer evident on the two surfaces, somewhat to prominently papillose. (Figure 2I–K)

Other specimens examined. WESTERN AUSTRALIA: 4.5 km at 115 degrees from junction of West Koojan Rd and The Midland Rd, 13 Nov. 1990, *E.A. Griffin* 6116 (PERTH); Mt Adams block, Quadrant

13, 1.2 km W of Natta Rd, 3.7 km S of Carey Rd, Shire of Three Springs, 14 Oct. 1998, *M.A. Langley & J.M. Harvey* 1875 (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province, recorded from the Mt Adams area (west of Arrino) and from near Koojan: GS, JF. Recorded from the upper slopes of breakaways, one record in yellow-brown sandy soil, the other two records in heavier soils with lateritic gravel. The vegetation was recorded either as open heath (two records) or very open shrub mallee over open low scrub. (Figure 1C)

Phenology. Flowers: July to October. Fruits recorded in October and November.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. Known from only three collections, at least one of them on private property. Two are in close proximity in the north and the other locality is well isolated, *c.* 170 km further south.

Etymology. Named in honour of Roger Hnatiuk, a biologist who was the first known collector of this species.

Notes. A very distinctive species, with a hypanthium similar to that of the three univoluate species of *Micromyrtus* in being papillose and very compressed but differing in having a constriction towards the summit. *M. rogeri* is readily distinguished from other south-western species by its white laciniate leaf margins, and it has extremely short stamens with the very reduced filament usually shorter than the length of the anther.

More material is needed, particularly in mature fruit, to describe the species fully. The largest immature seed observed in the material available was *c.* 1.4 mm long.

Micromyrtus uniovula Rye, *sp. nov.*

Bracteolae caducae vel deciduae. Alabastri apex hemisphericus. Hypanthium 2–2.3 mm longum, ex parte inferiore, dorsiventraliter compressum, costis 2 abaxialibus, 1 adaxialibus et 2 lateralibus, interdum minute papillatum. Sepala erecta, petalis multo brevioribus, integra. Petala alba, in fructu decidua. Stamina 10, obdiplostemona, brevissima. Ovulum 1.

Typus: on both sides of Bunny Rd, 4 km N of Nebru Rd, Western Australia, 21 October 1999, *L. Polomka & S.J. Patrick* 3307 (*holo:* PERTH 05541719; *iso:* CANB, K, MEL).

Shrub low and spreading to fairly erect, up to 0.4 m high. *Leaves* antrorse to almost patent, rather densely arranged distally on the branchlets. *Petioles* 0.3–0.5 mm long. *Leaf blades* narrowly to very broadly oblong-elliptic, 1.5–4.5 x 1–2 mm, thick, broadly obtuse, entire or almost so; lower surface convex and sometimes indented along midvein, with 5–8 prominent glands up to *c.* 0.1 mm diam. in each longitudinal row; upper surface concave. *Racemes* extending for up to *c.* 30 nodes, the flowers usually widely antrorse, tending to become patent or pendulous in fruit; peduncles 0.5–0.7 mm long. *Bracteoles* caducous or deciduous, scarious, ovate, 0.7–1.2 mm long, pale brown, acute, entire. *Flowers c.* 3 mm diam.; hypanthium somewhat to very dorsiventrally compressed in adnate part, somewhat narrowed towards base, 2–2.3 mm long, *c.* 1.3 mm wide at summit, free in distal 0.6–0.7 mm, distinctly 5-ribbed, with 2 abaxial, 1 adaxial and 2 lateral ribs, the adaxial surface with its central rib more or less level with

lateral ribs but somewhat to strongly indented in between the ribs (the margins of the hypanthium often strongly incurved), minutely papillose to almost smooth (but with somewhat protruding oil glands) on both surfaces, the papillae *c.* 0.05 mm long. *Sepals* erect in flower and fruit, scarious at least on the margin, depressed ovate, 0.3–0.4 mm long, 0.5–0.6 mm wide, pale brownish or darker with a pale margin, very broadly obtuse, entire. *Petals* widely spreading in flower, becoming erect then shed in fruit, broadly or very broadly obovate, *c.* 1.3 mm long, distinctly clawed at base, white, broadly obtuse, entire. *Stamens* 10, the antipetalous ones inserted on summit of disc and slightly exserted, the antisepalous ones inserted about half way down the free tube and reaching the throat of flower; filament *c.* 0.4 mm long. *Anthers c.* 0.35 mm long; slits very oblique (often almost transverse); gland very broad and extending laterally beyond the cells, 3-lobed, with 2 large lateral lobes of a similar size to apical portion. *Ovary* with a solitary ovule in a more or less terminal cavity. *Style c.* 0.4 mm long. *Fruit* not seen at maturity but apparently not as compressed as in *Micromyrtus ninghanensis*, the most mature seen *c.* 1.8 mm long; hypanthium often somewhat papillose. (Figures 2L–O, 3)

Other specimens examined (all PERTH). WESTERN AUSTRALIA: 4 km N of junction of Three Springs West Rd with Eneabba–Mingenew road, 21 Oct. 1982, *J. Coleby-Williams* 269; 2 km W along Thomas Rd, SW of Three Springs, 26 Sep. 1990, *R.J. Cranfield* 7885 *& P.J. Spencer*; 2.5 km E along Nebru Rd from intersection of Arrino South Rd, 8.5 km W of Three Springs, 2 Oct. 1990, *R.J. Cranfield* 7903 *& P.J. Spencer*; 3 km N of the Three Springs West Rd along the Mingenew–Eneabba road, 2 Oct. 1981, *L.A. Craven & C. Chapman* 6873 (also CANB *n.v.*); Bunney Rd, 4 km N of Nebru Rd, 2 Dec. 1999, *S.J. Patrick* 3359; on Bunny Rd, 4.3 km N of Nebru Rd, just S of Robinson Rd, 22 Oct. 1999, *L. Polomka & S.J. Patrick* 3307; 8.6 miles [13.8 km] SW of Three Springs on road to Eneabba, 10 Sep. 1978, *M.E. Trudgen* 2200 (also CANB, K *n.v.*).

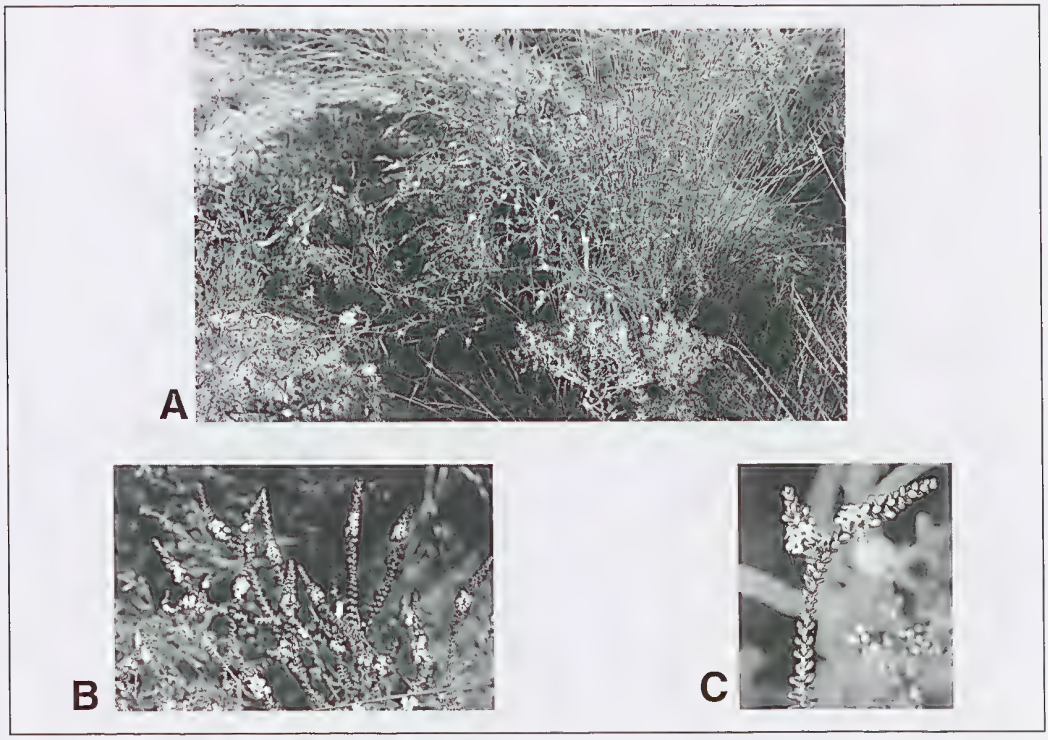

Figure 3. Photographs of *Micromyrtus uniovula* taken at the type locality by S. Patrick. A – whole plant; B – flowering stems; C – flowers.

Distribution and habitat. Endemic to the South West Botanical Province, restricted to a small area west of Three Springs: AW, GS. Occurs on lateritic rises, in sandy soil over laterite. (Figure 1B)

Phenology. Flowers: September to November. Fruits: October to December.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. This taxon is known from about eight collections over a geographical range less than 15 km long.

Etymology. From the Latin *unus* – one and *ovum* – egg, this apparently being the most common of three new taxa described here that have only one ovule in the ovary. All previously described species of *Micromyrtus* have 2–10 ovules.

Notes. Previously known by two informal names, *Micromyrtus* sp. Arrowsmith River (*L.A. Craven* 6873 & *C. Chapman*) and *Micromyrtus* sp. Three Springs (*R.J. Cranfield* 7885).

This species is very closely related to *Micromyrtus ninghanensis*, differing in its oblong-elliptic rather than obovate leaves and longer flowers, with the hypanthium less compressed, more narrowed at the base and with a more prominent adaxial rib. Its fruit and seed are apparently much less compressed but good fruiting material is needed to confirm this difference between the two species. The two taxa are allopatric, with *M. uniovula* occurring in lateritic habitats and *M. ninghanensis* occurring *c.* 150 km further inland on volcanic rocks.

Micromyrtus uniovula is also closely related to *M. papillosa* but differs in its shorter pedicels, less strongly clawed petals and ten stamens.

Discussion

The eastern species of *Micromyrtus* have been classified informally as belonging to the '*Micromyrtus ciliata* group' (revised by Green 1983b), '*M. leptocalyx* group' and '*M. hymenonema* group' (see Bean 1996). These are all subgroups of the few-ribbed category of species revised in this paper. The first two of these subgroups are restricted to eastern Australia, while the third extends to the arid zone of Western Australia. Further subgroups could be recognised in Western Australia, including one for the three very closely related species that were previously combined under the name *M. obovata*. Unlike the eastern subgroups, this western subgroup has a constant ovule number of two.

Green (1983b: 317, 329) indicated that there was greater diversity among Western Australian than eastern species of *Micromyrtus*, and recognised four informal sections for the western species, two of them with five stamens and two with ten stamens. One of his 5-staminate sections comprised the two species *Micromyrtus flaviflora* and *M. barbata*, and the other consisted of a single unnamed species that is described here as *M. papillosa*. Green did not list any species for his 10-staminate sections, which he described as having "a narrow-cylindrical floral tube", although the 10-staminate species show a much greater variation in their hypanthium shape than this suggests. A strict division into 5- and 10-staminate sections is not supported by the present study, in which the 5-staminate *M. papillosa* is considered to be closely related to three other new species that are all 10-staminate. The *M. obovata* subgroup also precludes a strict division into 5- and 10-staminate sections in Western Australia, since it includes the 5–10-staminate *M. erichsenii*.

More work is needed to determine how many infrageneric groups should be recognised in Western Australia, and how many south-western taxa with a ten-ribbed hypanthium should be recognised. The most difficult species complex is the one including *Micromyrtus racemosa* Benth. Two of the varietal manuscript names that have been applied to this species, *M. racemosa* var. *carinata* J.W. Green ms. and *M. racemosa* var. *latifolia* J.W. Green ms., clearly belong to a separate species, but the status of the many other variants in this complex has yet to be determined.

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References

Bailey, F.M. (1900). "Queensland Flora." Part 2. (Diddams & Co.: Brisbane.)

Bean, A.R. (1996). A revision of *Micromyrtus* Benth. (Myrtaceae) in Queensland. *Austrobaileya* 4: 455–476.

Beard, J.S. (1980). A new phytogeographic map of Western Australia. *Western Australian Herbarium Research Notes* 3: 37–58.

Bentham, G. (1865). *Micromyrtus*. *In:* Bentham, G. & Hooker, J.D. "Genera Plantarum." Vol. 1, part 2, p. 700. (Reeve & Co.: London.)

Bentham, G. (1867). "Flora Australiensis." Vol. 3. (Reeve & Co.: London.)

Blackall, W.E. & Grieve, B.J. (1980). "How to Know Western Australian Wildflowers." Restructured and revised 2nd edn by B.J. Grieve. (University of Western Australia Press: Nedlands, Western Australia.)

Briggs, B.G. & Johnson, L.A.S. (1979). Evolution in the Myrtaceae – evidence from inflorescence structure. *Proceedings of the Linnean Society of New South Wales* 102: 157–256.

Diels, L. & Pritzel, E. (1904). Myrtaceae. Fragmenta phytographiae Australiae occidentalis. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 35: 398–444.

Fitzgerald, W.V. (1905). Some new species of west Australian plants. *Journal of the West Australian Natural History Society* 2: 21–31.

Gardner, C.A. (1931). "Enumeratio Plantarum Australiae Occidentalis." (Government Printer: Perth.)

Green, J.W. (1979). *Corynanthera*, a new genus of Myrtaceae (subfamily Leptospermoideae, tribe Chamelaucieae). *Nuytsia* 2: 368–374.

Green, J.W. (1980). *Thryptomene* and *Micromyrtus* (Myrtaceae) in arid and semi-arid Australia. *Nuytsia* 3: 183–209.

Green, J.W. (1983a). *Malleostemon* a new genus of Myrtaceae (subfamily Letospermoideae, tribe Chamelaucieae) from south-western Australia. *Nuytsia* 4: 295–315.

Green, J.W. (1983b). Taxonomy of *Micromyrtus ciliata* (Myrtaceae) and allied species including three new species of *Micromyrtus* from eastern Australia and lectotypification of *M. minutiflora*. *Nuytsia* 4: 317–331.

Hemsley, W.B. (1905). *Micromyrtus erichsenii*, Hemsl. *Hooker's Icones Plantarum* 28: t. 2780.

Hunter, J.T., Quinn, F.C. & Bruhl, J.J. (1996). *Micromyrtus grandis* (Myrtaceae), a new species from New South Wales. *Telopea* 7: 77–81.

Moore, S. le M. (1920). A contribution to the flora of Australia. *Journal of the Linnaean Society*, Botany 45: 159–220.

Mueller, F. (1873). Myrtaceae. *In:* "Fragmenta Phytographiae Australiae." Vol. 8, pp. 13–15. (Government Printer: Melbourne.)

Rye, B.L. (1979). Chromosome number variation in the Myrtaceae and its taxonomic implications. *Australian Journal of Botany* 27: 547–573.

Rye, B.L. & James, S.H. (1992). The relationship between dysploidy and reproductive capacity in Myrtaceae. *Australian Journal of Botany* 40: 829–848.

Smith-White, S. (1950). Cytological studies in the Myrtaceae. III. Cytology and phylogeny in the Chamaelaucoideae. *Proceedings of the Linnean Society of New South Wales* 75: 99–121.

Thackway, R. & Cresswell, I.D. (1995). (eds) An interim biogeographic regionalisation for Australia: a framework for establishing the national system of reserves, version 4.0. Published Report of the Australian Nature Conservation Agency: Canberra.

Wilson, Peter G. (1991). *Micromyrtus. In:* Harden, G.J. "Flora of New South Wales." Vol. 2, pp. 186–188. (New South Wales University Press: Kensington.)